ADVISOR 2
A Study of Industrial Marketing Budgeting
Part 1: Background, Data and Norm Models

Gary L. Lilien

WP 991-78 May 1978

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This paper represents the results of efforts by many people. Professors Jean-Marie Choffray of ESSEC, John Little and Alvin Silk of MIT were all influential in formulating and performing this analysis. In addition, Jessie Abraham, Donald Barefoot, Barbara Bolshon, Sandy Fitchet, Gregory Resker and Mary Ann Ritter contributed significantly to developing these results. We are indebted to Donald Gluck of duPont for stimulating the start of the ADVISOR Project, to Harry Darling of ANA for helping it to prosper and to all of the representatives from the participating companies for their time, support and creative input.

Abstract

This paper is the first of a two-part report on the ADVISOR 2 study, aimed at providing a quantitative understanding of marketing budgeting practice for industrial products. The study, involving 22 companies and 131 products has produced models for advertising expenditures, advertising/marketing splits, marketing expenditures and media allocation.

The level of advertising and marketing expenditures and the split of the marketint expenditures into advertising and personal selling are shown to be determined by a few key market characteristics. The primary influencing factors are product sales levels and number of customers. Other factors of key (but lesser) importance are

- stage in the life cycle
- customer sales concentration
- fraction of product sales which are made-to-order
- company plans for the product
- technical complexity of the product
- perceptions of product quality
- distribution channel strategy.

Analysis shows that it is fruitful to study advertising budgeting as

$$\text{Advertising} = \frac{\text{Advertising}}{\text{Marketing}} \times \text{Marketing}$$

i.e., a marketing budget is set and then a split of that budget into personal and impersonal communications is made. This two-stage view clarifies the role of different product and market characteristics. All the variables above affect the marketing budget.

The advertising budget can be split into personal media (those most closely associated with personal communication: sales promotion, trade shows and films) and impersonal media. No variables were significant here beyond those found significant for advertising. Overall, the level of expenditure in personal media varies more with product and market characteristics.

The second part of this paper reviews budgeting change models, distribution channel models and uses of the results.

1. Introduction:

Industrial marketing, the marketing of goods and services to industrial, commercial and government organizations for consumption or resale, has long been the neglected step-child of quantitative marketing analysis: consumer marketing has been the researcher's major focus. There are several reasons for this:

- potential customers are often few in number: statistical inference associated with large samples often does not apply;
- product-markets are often more limited in size than consumer markets;
- customers are many different sizes: a five-man shop and General Motors may both be potential customers for some machine parts. This leads to both measurement and aggregation problems.
- organizational buying is more complex. There are frequently several individuals with different preferences, perceptions and buying motives involved in the purchasing process over a period of time. This, again leads to idiosyncratic measurement and modeling problems. (See Choffray and Lilien [2] for a detailed discussion of solutions to this problem.)

Yet, as Webster [7] points out, with well over half of America's economic activity accounted for by industrial marketing activity, it is not surprising to see this field beginning to come of age. The sheer volume of these transactions (well over $1/2 trillion) suggests it would not be surprising to find that industrial marketing problems, in spite of their solution difficulty, have captured the attention of management scientists.

Webster indicates that some significant progress has been made. The ADVISOR studies, aimed at providing quantitative guidance for industrial marketing budgeting decisions, are part of the effort to bring scientific focus on industrial marketing problems.

2. Background

In 1973, twelve major companies with heavy involvement in the marketing of industrial products got together with MIT and the Association of National Advertisers to develop a unique study. The focus of the study was the marketing mix problem, with emphasis on the role of the marketing communications within that mix:

- How should funds be allocated to such activities as direct sales, customer service and marketing communications (advertising and other customer-directed promotions)?
- Should a product be advertised at all?
- What types of communications will best support current selling objectives?
- Are there special requirements, in this market, at this time, which suggest changes in marketing expenditures?

The base for the study was extensive market, product and customer data for a wide range of products supplied by the participating companies. That experimental program -- ADVISOR 1 -- was completed early in 1976. (See Lilien and Little [5], and Lilien [4] for a review of the results. Lilien et al. [6] give a complete review of advertising effects and budgeting practice.) General results were reported and the sponsoring companies have been using the model developed from the data for a variety of purposes.

ADVISOR 1 looked, at a single point in time, at the practice of companies for a diverse sample of products. It identified a number of marketing variables which seemed most highly to affect marketing mix decisions.

But perhaps ADVISOR 1's major contribution was that it established both the value and validity of using a cross-sectional analysis of real data to study industrial marketing decisions. It established that the factors involved in marketing budgeting for industrial products have much in common. And it

showed that budgeting norms or guidelines could be developed from those analyses which would have much strategic importance.

Early in 1977, a larger and more sophisticated study -- ADVISOR 2 -- began with 22 companies participating (see Exhibit 1). They provided data for a total of 131 products. The objectives of ADVISOR 2 were:

1) To confirm the results of ADVISOR 1 with a larger data base;
2) To extend the range of the study by adding several years of practice, and analyzing budgeting changes,
3) To add an important new dimension -- in-depth analysis of "natural" experiments in the marketing mix to develop tools to maximize the efficiency of mix decisions. (Work in this area is still progressing and will not be reviewed here).

EXHIBIT 1:

ADVISOR 2 Participants

Sponsors

AT&T Long Lines	International Paper
Collins & Aikman	3M
DuPont	Nordson
Emery Industries	Norton
GE	Owens-Corning Fiberglas
Goodyear	Pittsburgh-Corning
Harris Semi-Conductor	Siliconix
International Harvester	Union Carbide
U.S. Steel	

Data Donors

Inland Steel	Photomarker
Joslyn Mfg.	SCM
Singer	

To briefly restate what our objectives are, we search for descriptive models of industrial marketing budgeting practice. These models are based on the assumption that there are a small set of general (non-product-specific) product and market factors involved in creating industrial marketing budgets.

There is evidence (see Lilien et al. [6] for a discussion) to trust the trial-and-error judgements of experienced industrial marketing decision makers to provide guidelines for what should be done. However, these results are not meant to be prescriptive, and should better be used to ask questions than to provide answers. (The section on use in Part II of this paper elaborates on this issue.)

3. ADVISOR 2 Data Base

The conclusions from ADVISOR 1 suggest that a follow-up study is in order. In a manner similar to that for ADVISOR 1 (see Lilien [4]), a questionnaire was developed and distributed to participating companies. A total of 131 completed questionnaires were returned, of which 125 were sufficiently detailed and were received early enough to be included for complete analysis. We review a few key characteristics of those data.

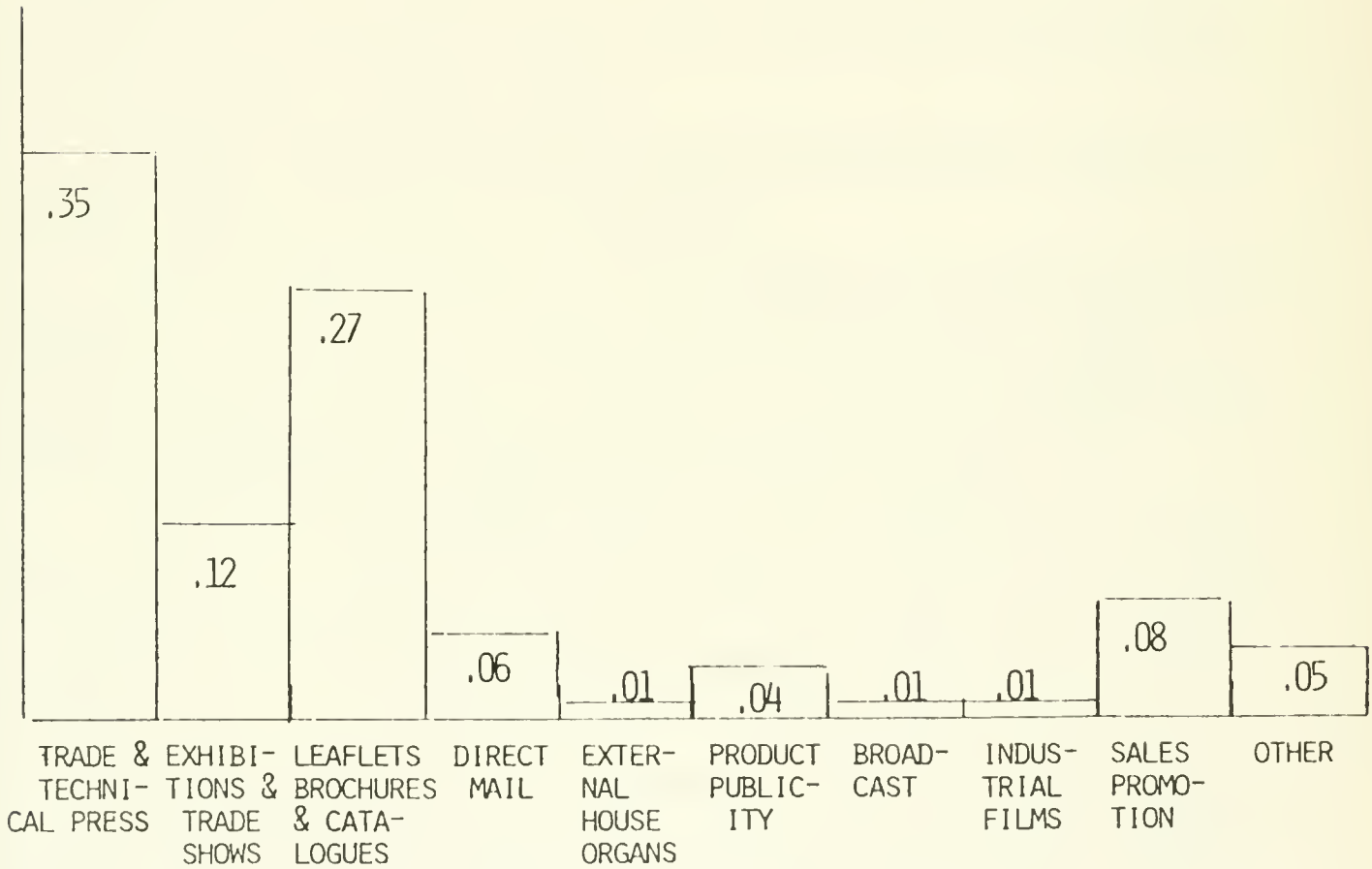
Exhibit 2 compares some operating ratios in ADVISOR 1 with those in ADVISOR 2.

EXHIBIT 2: ADVISOR 1/ADVISOR 2 Data Comparisons

	MEDIAN			
	ADVERTISING / SALES	ADVERTISING / MARKETING	MARKETING / SALES	SAMPLE SIZE
ADVISOR 1(1973 data)	0.6%	9.9%	6.9%	66
ADVISOR 2(1975 data)	0.7%	10.0%	7.0%	131

The ADVISOR 1 and ADVISOR 2 data are remarkably consistent. They are even closer than they look: ADVISOR 1 contained only out-of-pocket advertising costs while company internal costs, including overhead, are included in ADVISOR 2. Thus the data, two years later and from a completely different set of products, show remarkable similarity. Mean allocation of advertising budget to media is also similar. ADVISOR 2 allocations are displayed in Exhibit 3.

EXHIBIT 3



MEDIA ALLOCATION:

MEAN FRACTION OF 1975 ADVERTISING DOLLARS

Exhibit 4 displays the stated principle product category. The products in the data base are widely scattered, with machinery and equipment and fabricated material being the largest categories.

Exhibit 5 shows the distribution of the stage in the product's life cycle. As that exhibit shows, the data base is dominated by products in the growth and maturity stages. Other products are eliminated from the data base, as described in the next section.

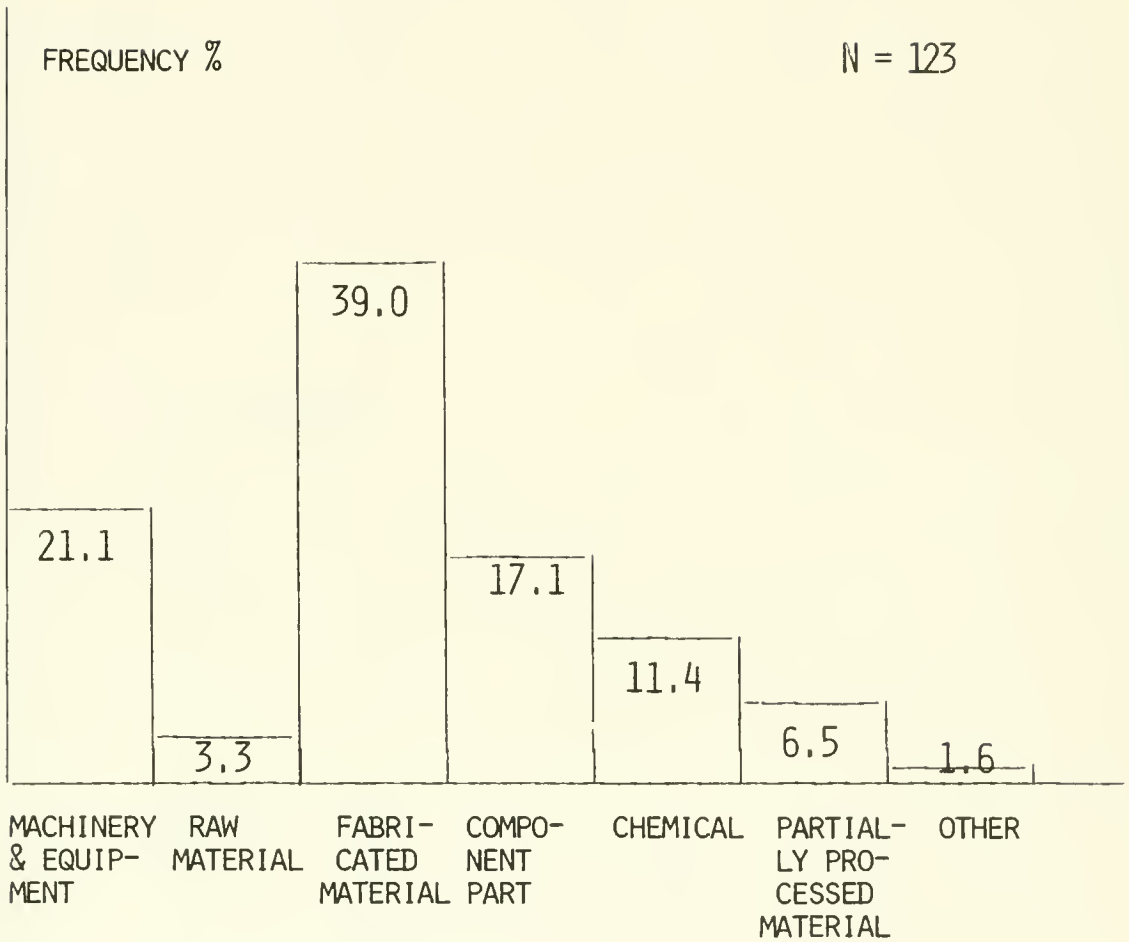
Exhibit 6 gives the fraction of sales direct to users (as apposed to through independent resellers). The exhibit shows that sample products are split between those products which go direct (through a salesforce) and those that go through a distributor network.

Exhibit 7 displays dollar market share for these products. The median observed value is .20 versus .185 in ADVISOR 1.

Finally Exhibit 8 breaks out the distribution of advertising associated with what we refer to here as "personal media" (exhibitions and trade shows, sales presentations and films) -- those which are associated most closely with personal communications. The median level observed here is 16%.

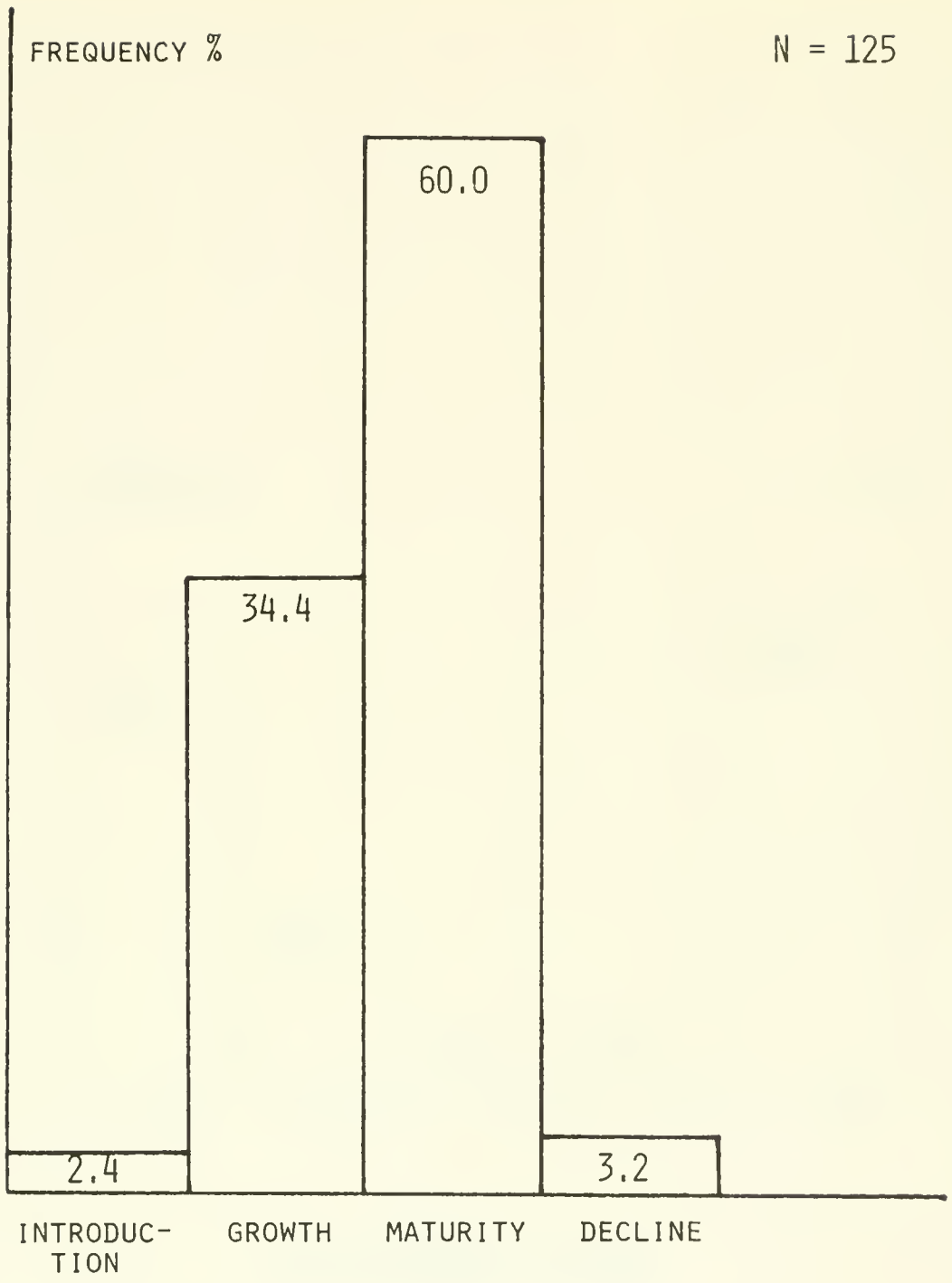
The ADVISOR 2 questionnaire contains a total of 223 separate data items. Our objective is to develop a parsimonious model, one with as few key variables as possible, which represent relatively independent product-market characteristics.

In line with this objective, an extensive procedure of data screening, including recoding and combining similar variables, was undertaken. Guided by our ADVISOR 1 experience, this procedure resulted in the following key variable-categories that relate to the advertising and marketing variables of interest:



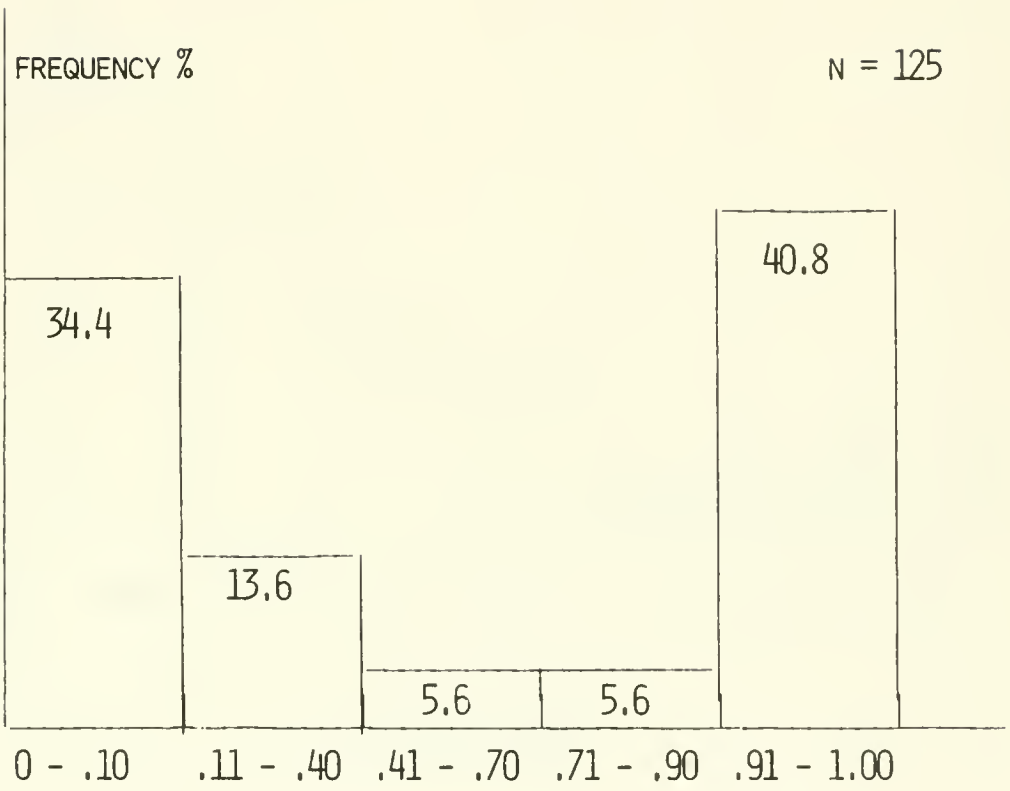
PRINCIPAL PRODUCT CATEGORY

EXHIBIT 4



STAGE IN LIFE CYCLE

EXHIBIT 5

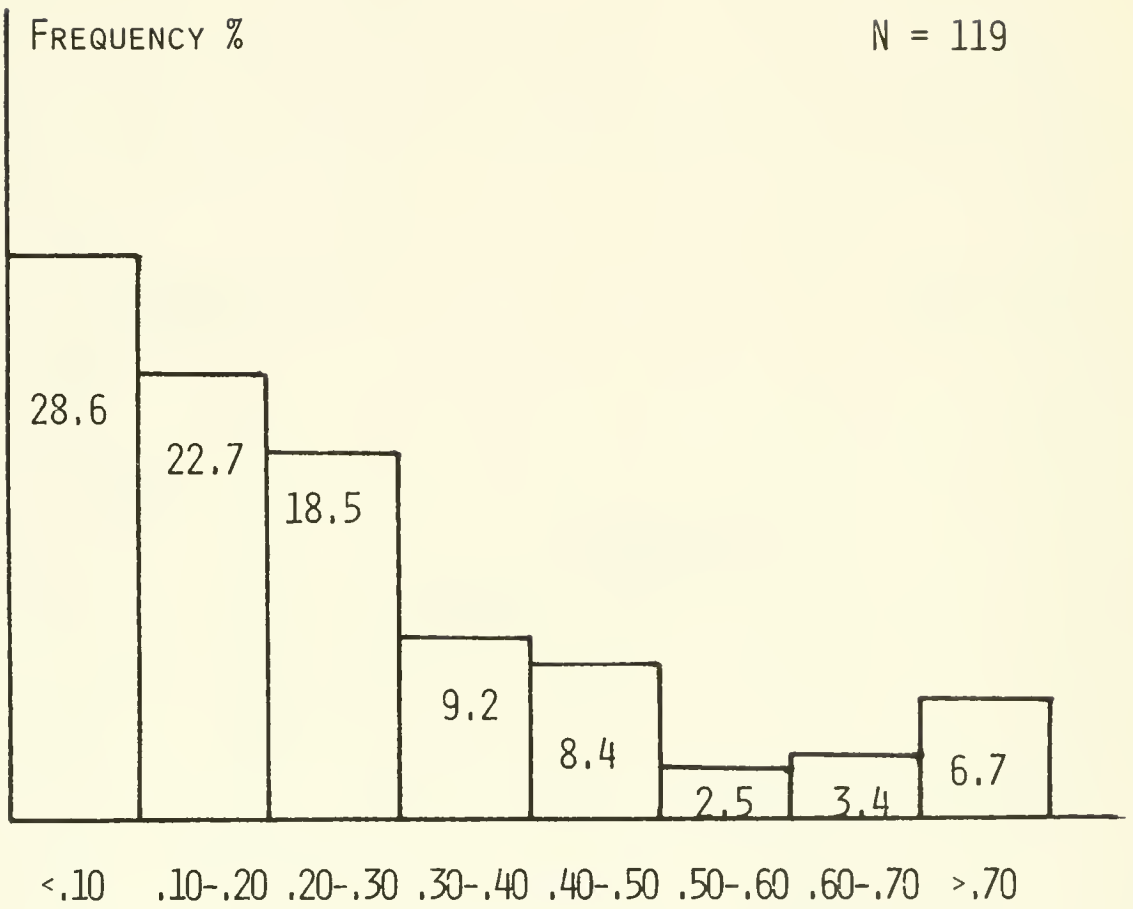


% OF SALES DIRECT TO USERS

MEAN = .53

MEDIAN = .60

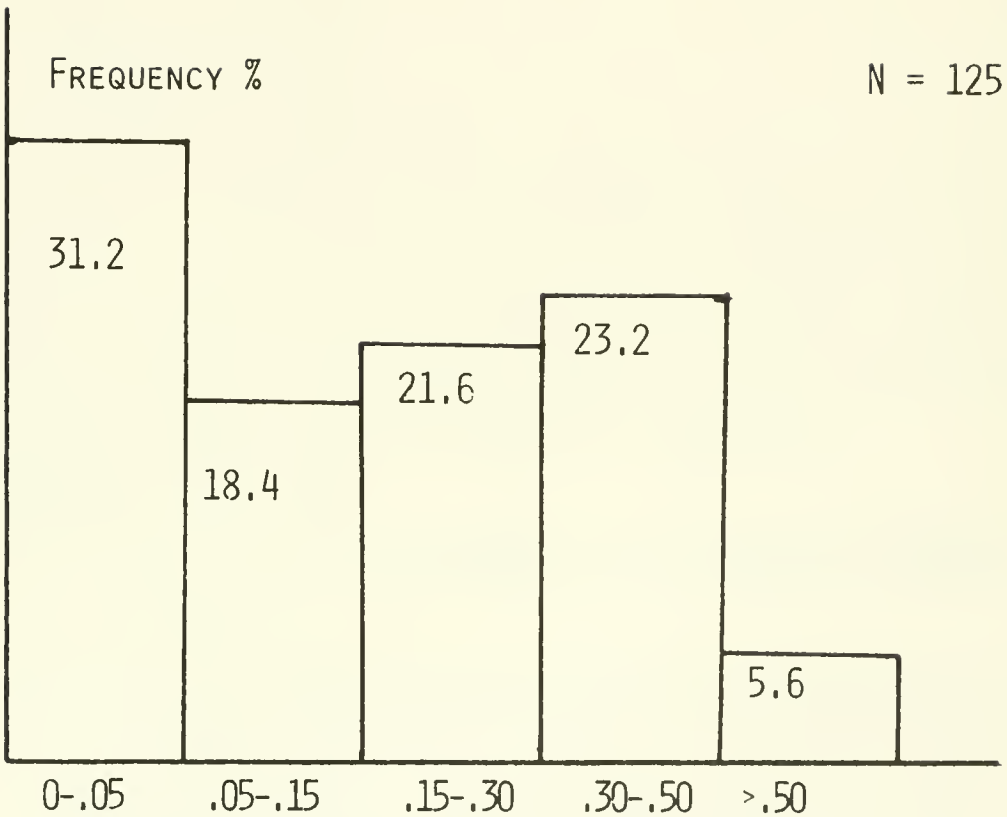
EXHIBIT 6



MARKET SHARE

MEAN = .25
MEDIAN = .20

EXHIBIT 7



FRACTION OF ADVERTISING DOLLARS SPENT ON PERSONAL MEDIA

MEAN = .20
MEDIAN = .16

EXHIBIT 8

- sales level
- number of customers and their concentration
- stage in the life cycle
- product plans and objectives
- product made to order (versus carried in inventory)
- product complexity
- product perceptions
- distribution channels used.

These eight variable categories correspond roughly to the key variable categories in ADVISOR 1. (The differences are compared in Section 6). The key addition is that of product plans and objectives, which measure company attitude toward the product. This variable accounts for much of the company-specific variance we were unable to account for in ADVISOR 1.

To summarize our findings:

1. 131 data points are available, 125 of which were included in analyses.
2. The data are fairly clean, but some of the key variable distribution (like that of advertising level) have long right hand tails, suggesting, perhaps, a log transformation prior to analysis.
3. Independent variables tend to fall into the broad categories detailed above. Single or combination variables in each of these categories will be investigated for inclusion into the models.

4. ADVISOR 2 Norm Model Development

4.1 ADVISOR 1 Theory and Weaknesses

ADVISOR 1 (Lilien [4]) resulted in linear, additive models, with Advertising/Sales (A/S), Advertising/Marketing (A/M), and Marketing/Sales (M/S) ranked by size and related to dichotomous independent variables. The model corresponds to the following conceptual budgeting framework. The decision maker is assumed to have a check-list of product-market and environmental characteristics relevant to the budget decision. The values of the characteristics are only known roughly ("high" versus "low", for example), with the final value of each characteristic adding or subtracting some value from the final budget score.

The results of ADVISOR 1 were quite good, but clearly there are some significant limitations.

1. All other things being equal, A/S is constant, independent of sales level. This equates with a constant return to scale for advertising, a perhaps unrealistic assumption which should be checked empirically.

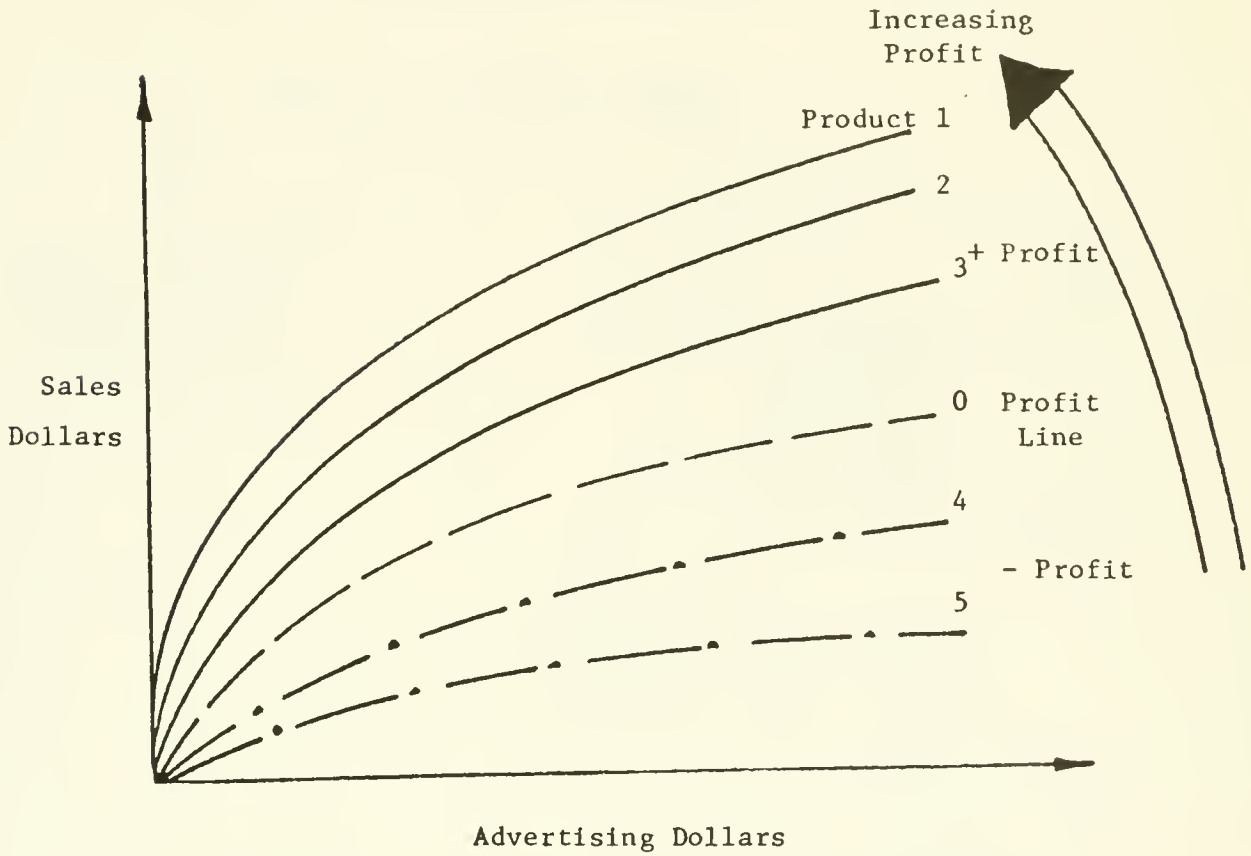
2. New products do not have a sales history, suggesting that modeling the A/S ratio is not a viable procedure there.

3. ADVISOR 1 included products that had no spending for advertising as well as those with positive advertising. There may be many reasons for advertising to equal zero, but they cannot be determined.

The explanation for the problems discussed in item 3 can be seen in Exhibit 9. There, products 1, 2 and 3 show positive returns to advertising investment

Exhibit 9

Advertising Response and Advertising Budget Decisions



while 4 and 5 show negative returns. Hence, a rational manager will spend advertising dollars on products 1, 2 and 3, and on 4,5 even though 4 and 5 show different responses.

The most promising direction for analysis, then, it to try to determine what the line of demarcation between positive and zero advertising is and to try to discriminate statistically between these groups.

Exhibit 10 outlines the conceptual structure of our analysis. This suggests (a) a separate analysis for new and established products; (b) discriminating between "0" advertising and "+" advertising situations; and (3) conditional to positive advertising, developing a norm.

Exhibit 10

Logical Model Development

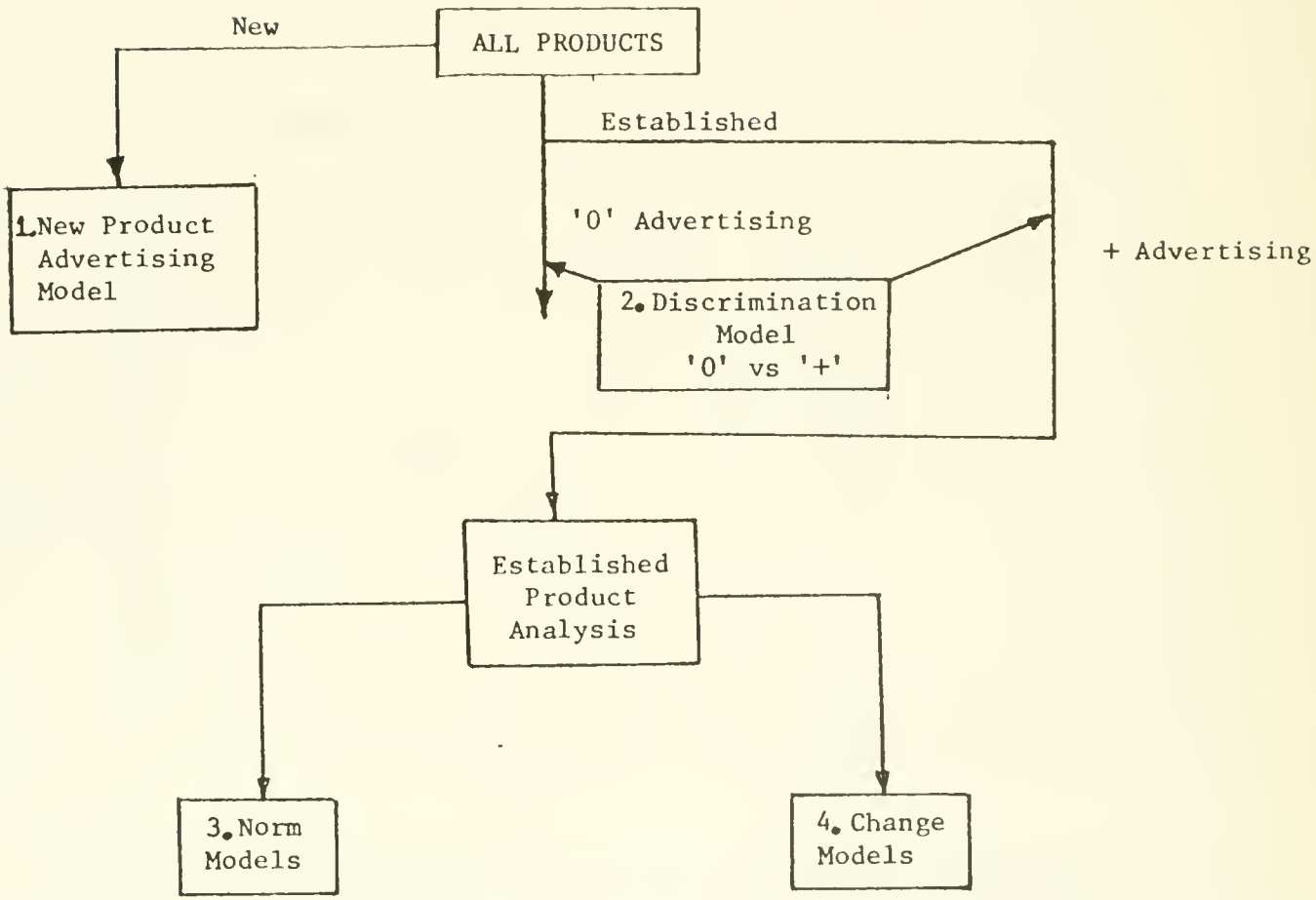


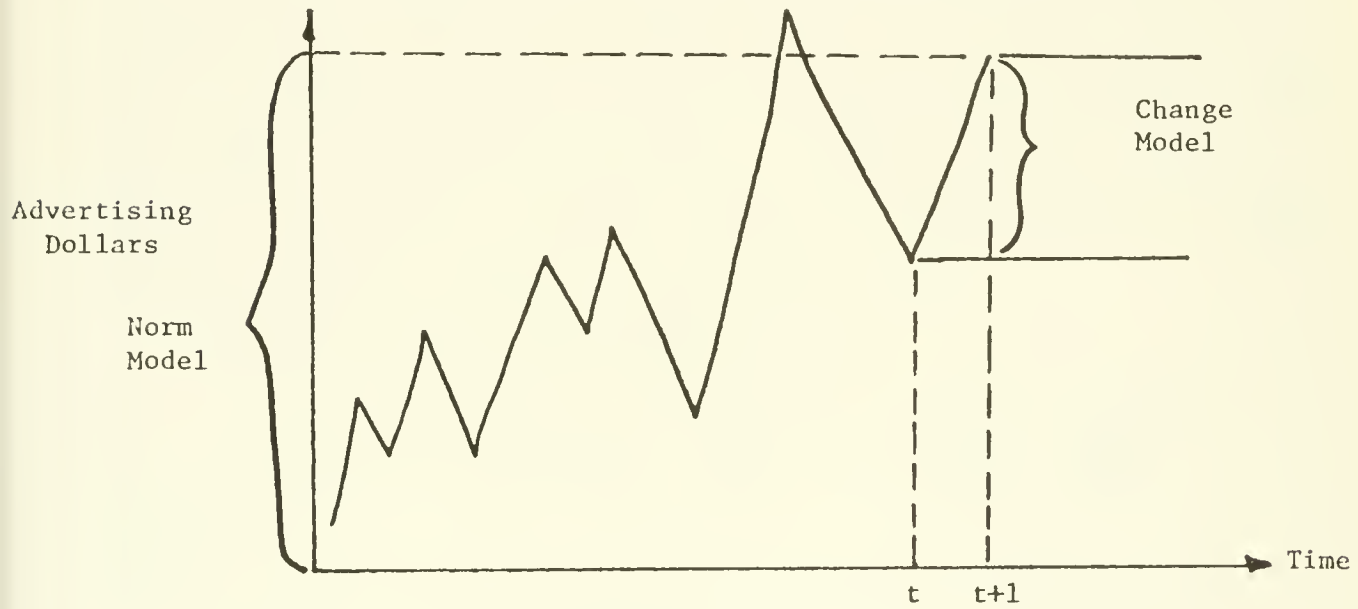
Exhibit 10 also introduces the concept of a change model, as well as the norm model. The norm model looks at the level of advertising and relates it to general, stable elements in the product-market and environment. This is a strategy component.

Advertising however, can be changed tactically, at annual or more frequent intervals, to react to changes in the environment. Thus, change models are developed to explain year-to-year proportional changes in advertising

expenditures. Exhibit 11 demonstrates the relationship between these models. The change models are developed in detail in Part II of this paper.

Exhibit 11

Relationship Between Norm Model and Change Model



With respect to the analysis that follows, only eight widely diverse products were available in the introduction stage of the life cycle, not enough for analysis (1) in Exhibit 10. Only four ADVISOR 2 products reported $0 in advertising, which was also too small a group for performing analysis (2).

Thus, these products were screened out of the sample so that only analyses (3) and (4) were performed. When discussing those models, it should

be understood that the models are conditional upon (a) the product not being in the introduction or decline stage of its life cycle, and (b) a decision to spend some money on advertising.

4.2 Norm Model Structure

The norms models state that the level of advertising (or marketing) expenditure is fundamentally determined by the previous year's sales level (guideline budgeting) and by the number of customers for the product. They also suggest that advertising expenditure is modified by such factors as stage in the life cycle, customer concentration, special product (vs. made to order), technical complexity of the product, etc.

The structure of the norm model, then, is

$$(1) \qquad ADV_{75} = Bo \cdot SALES_{74}^{B1} \cdot USERS_{3}^{B2} \cdot \prod_{i} \cdot CVAR_{i}^{Bi} \cdot \prod_{j} B_{j}^{DVAR_j}$$

where

ADV = advertising dollars

SALES = sales dollars

USERS = number of users

$CVAR_i$ = continuous variable i, transformed to be greater than 1

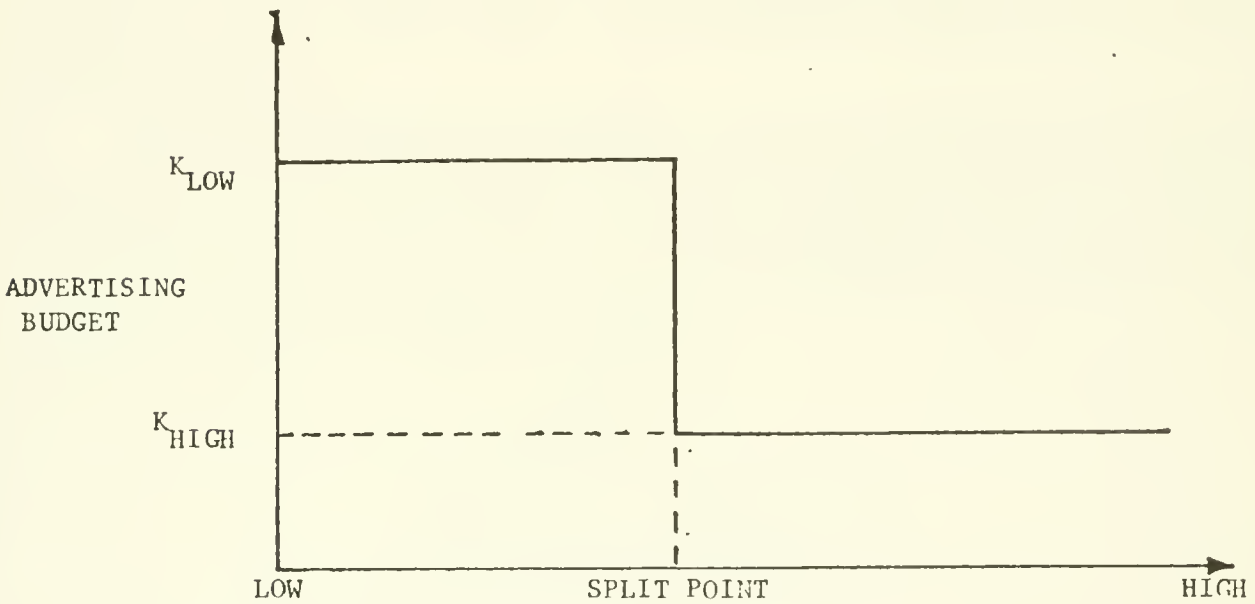
$DVAR_j$ = HIGH/LOW (0-1) indicator for variable j.

Two things should be noted about this postulated log-linear form. First, the coefficient of sales (B1) allows us to check on the adequacy of the ADVISOR 1 model (and of a similar effort by Buzzell and Farris [1]): an estimate of B1 significantly less than 1, points to important weaknesses in the ADVISOR 1 analysis (as will be shown to be the case).

Secondly, it includes some continuous second order variables as well as dichotomous variables (such as stage in the life cycle). This conflicts with the ADVISOR 1 structure, which postulated that managers categorize variables into high and low categories before processing, as shown in Exhibit 12 for customer concentration, for example.

Exhibit 12

ADVISOR 1 Independent Variable Structure



In order to develop the split point in ADVISOR 1, we relied upon the empirical sample median, a point that was, of necessity, data-base specific.

Our concept here is that managers use high-low splits, but that they may differ on the split points. Consider Exhibit 13, which still contains the same points K_{LOW} and K_{HIGH}. Assume that we have a product with customer concentration equal to X. Assume that some proportion $(\frac{A}{A+B})$ of advertising

managers consider this level to be low, while another proportion $(\frac{B}{A+B})$ consider it to be high. Then the effective impact on our advertising budgeting relationship is to have the effect,

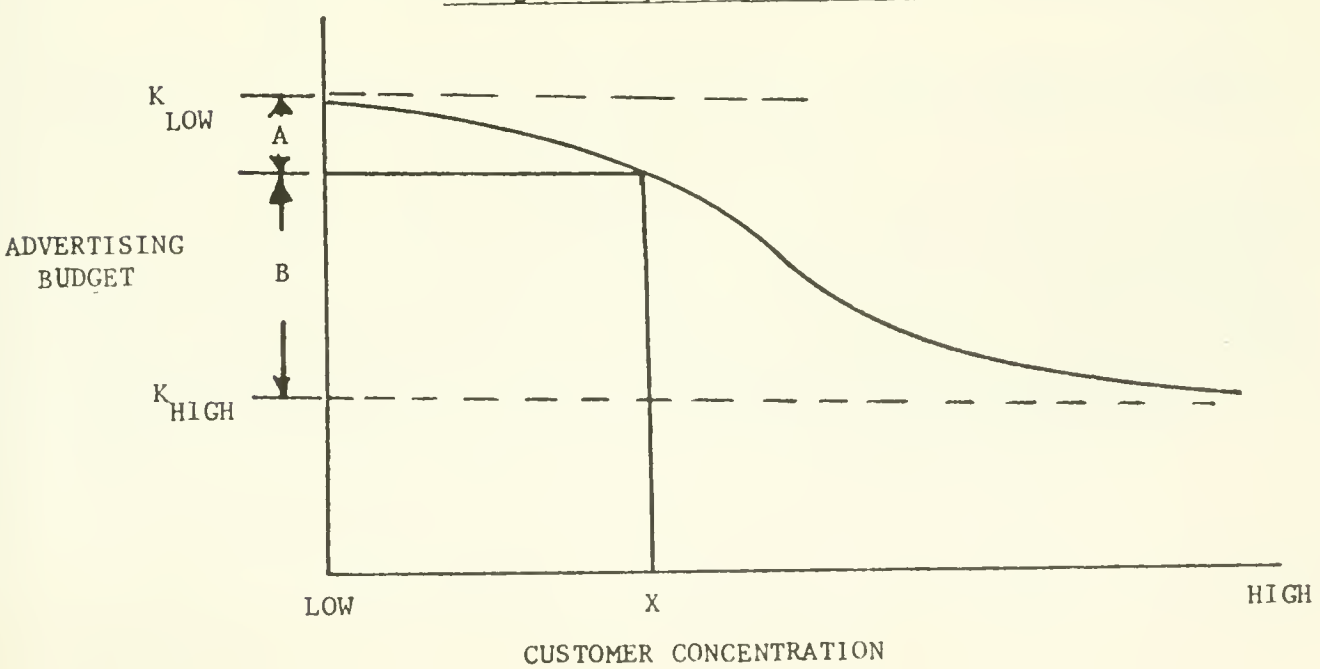
$$(2) \qquad K(X) = (\frac{A}{A+B})K_{LOW} + (\frac{B}{A+B})K_{HIGH} .$$

This is equivalent to substituting a continuous variable for the discrete variables used in ADVISOR 1. We use these variables to model marketing manager differences in high-low splits. (N.B.: The substitution of these continuous variables dod not improve model fit substantially, but did provide additional user-credibility.)

Note that the behavioral motivation here is the same as in probit analysis (see Finney [3]) with population heterogeneity assumed to take on a normal form. The functional forms used here, while not as satisfactory theoretically, are relatively robust and simple to estimate.

Exhibit 13

Managers Vary on Split Points



Finally, a word about the log-linear form as postulated in equation (1). This differs from the linear form in ADVISOR 1 in that it suggests that the effects interact, that they represent proportional changes rather than additive changes in budget levels. As the model is conditional to positive levels of advertising and sales (it is not a new product model) we need not be concerned about model behavior near the origin.

Hence, it we postulate a multiplicative error term of lognormal form, we can take the logarithm of equation (1) and use ordinary least squares to estimate the parameters. This analysis is performed next.

5. Model Calibration: Budgeting Levels

The first analysis step was to estimate parameters of a model identical to ADVISOR 1. This was done with the following results:

- The directions of the signs of all coefficients were the same as ADVISOR 1 except for "purchase frequency" which is measured differently in the two studies.
- The significance of the coefficients was low and the fit was poor.

These results suggest that we can confirm the ADVISOR 1 results on our data base, but that model improvements can be developed.

We screened obvious outliers from the data base. There were cases where advertising dollars were over 50 percent of lagged sales or where marketing dollars were greater than sales. Products in introductory or decline stages of the life cycle were eliminated, as were zero advertising products.

A series of regression equations were run, and in each case, scattergrams and standardized plots of residuals were examined to identify a few obvious outlying points representing inaccurate data. The main variables that appeared to relate to advertising, via prior correlation analysis (see Appendix 2) were:

SALES: product dollar sales in 1974

PLANS: level of aggresiveness of attitude toward 1975 product plans

SPECIAL: fraction of product sales made to order

LCYCLE: stage in the product life cycle -- growth or maturity

USERS: number of independent resellers, users plus downstream specifiers associated with the product

CONC: industry concentration: fraction of industry sales purchased by three largest customers.

(The exact definition of these variables is found in Appendix 1).

Exhibit 14 gives the resulting model for advertising.

EXHIBIT 14

Advertising Model

$$
\begin{aligned}
LN(ADV) = & -.651 \\
& +.618\ LN(SALES) \quad (9.1) \\
& +.104\ LN(USERS) \quad (3.6) \\
& -1.881\ LN(CONC) \quad (3.1) \\
& -1.898\ LN(SPECIAL) \quad (4.4) \\
& -\ .892\ LCYCLE \quad (3.7) \\
& +1.503\ PLANS \quad (6.0)
\end{aligned}
$$

$R^2 = .59$

SEE = 1.12

F =25.0

N =110. (t-statistics in (.))

Using the same procedure, the following additional variables were found to be related to marketing:

PROD: indicator of product-definition complexity (machinery or component part)

DIFFPERC: difference in perceived quality between current and prospective customers (1 = current customers perceived quality higher than prospects, 0 otherwise)

DIRUSERS: fraction of product sales made to users, not through independent resellers.

Exhibit 15 gives the model for marketing.

Exhibit 15

Marketing Model Results

LN(MKTG) =	+ .185		
	+ .712	LN(SALES)	(12.6)
	+ .082	LN(USERS)	(3.1)
	-1.633	LN(CONC)	(3.1)
	- .993	LN(SPECIAL)	(2.8)
	- .424	LCYCLE	(2.0)
	+ .809	PLANS	(3.9)
	+ .528	PROD	(2.5)
	- .305	DIFFPERC	(1.7)
	+ .194	LN(DIRUSER)	(0.6)

R^2 = .72

SEE = .91

F = 28.2

N = 110 (t-statistics in (.))

Finally, the advertising/marketing model is estimated. We do not search for new variables, noting that

$$\text{Advertising} = \frac{\text{Advertising}}{\text{Marketing}} \times \text{Marketing}$$

and that the variables that affect advertising/marketing should already be included in the model. The resulting equation is displayed in Exhibit 16. Several additional points had to be screened as outliers from this relationship.

Exhibit 16

Advertising/Marketing Model Results

LOGIT(A/M) = + .544

- .232 LN(SALES) (4.5)

- .230 PROD1 (1.2)

+ .383 DIFFPERC (2.0)

- .255 DIRUSERS (1.1)

R^2 = .24

SEE = .91

F = 7.5

N = 100 (t-statistics in (.)).

Exhibit 17 compares the models, looking only at the directions of the relationships.

Exhibit 17

Model Comparisons

	SALES	USERS	CONC	SPECIAL	LCYCLE	PLANS	PROD	DIFFPERC	DIRUSERS
ADV	+	+	-	-	-	+			
A/M	-						-	+	-
M	+	+	-	-	-	+	+	-	+

Let us examine this figure one column at a time.

SALES: Both advertising and marketing are strongly and positively related to sales. The interesting relationship is that with A/M: as sales goes up, advertising gets less of the marketing dollar. This may result from there being a limit on possible media spending, while no such limit exists on the sales force. We also note that the coefficient of advertising (.618, standard error = .07) is significantly less than 1, as was implicit with our ADVISOR 1 model results. Thus, we have significantly modified and improved the form of the model in ADVISOR 2.

USERS: The more users, the more money is spent on marketing and on advertising. There is no readable effect on the A/M ratio.

CONC: The more concentrated the purchases (the greater the fraction of sales to the three largest customers), the less is spent in advertising and in marketing. The more concentrated are sales, the less is required for marketing expenditures. The A/M ratio is unaffected.

SPECIAL: If a large proportion of a product's sales is special (i.e., made to order) both the advertising and marketing budgets are lower. The product is most likely a design-item, and marketing communications is secondary to customer generated need. Once again, we see little effect on the A/M ratio.

LCYCLE: At the growth stage in the life cycle of the product, more is spent in advertising and in marketing than when the product is in the mature stage. Little effect is seen on the A/M ratio.

PLANS1: This variable reflects high aggressiveness of company plans for the product. Under these circumstances, both advertising and marketing expenditures are increased and A/M is unaffected.

PROD: If a product is fairly complex (such as machinery) and has a difficult, technical story to tell, more must be spent marketing it (positive effect on marketing) and personal selling is more frequently used to communicate the message. We see little effect on the level of advertising.

DIFFPERC: Current customers ranking product quality higher than prospects is associated with a situation in which a company is not aggressively marketing the product, and is lowering the level of the sales force. Marketing is lowered and the advertising/marketing ratio increases, with no effect on advertising.

DIRUSERS: If the proportion of sales direct ot users is high, then the sales force has to be comparably high, leading to effects that are the reverse of those for DIFFPERC: negative effect on A/M, positive on M, no effect on A.

Thus, these models seem to fit well and to give results that are intuitively understandable and internally consistent. It is important to note in Exhibit 17 that only sales level affects all three equations: all other equations balance, with each variable affecting only two of the equations.

6. Comparisons with ADVISOR 1

It is important to see how these new norm models compare with the results found in ADVISOR 1. As noted earlier, we expected and found more variables that were significant due to the larger data base. Exhibit 18 compares the analyses.

Exhibit 18

Comparison of ADVISOR 1 and ADVISOR 2

	Advisor 1		Advisor 2
1.	Life cycle	✓	Life cycle
2.	Concentration	✓	Concentration
3.	Customer growth	✓	Users, plans
4.	Quality, uniqueness	✓	Plans
5.	Purchase frequency	✓	Measured differently and found to be an ambiguous variable; dropped
6.	Market share	?	?

As Exhibit 18 indicates, we are consistent with life cycle and customer concentration. Customer growth rate was related to and found better represented in ADVISOR 2 by product plans and the number of users (a large number of users and positive product plans relates closely to growth in the customer base).

Quality and product uniqueness is also associated with company plans (support is given for those products which a company feels are unique).

Purchase frequency was found to be ambiguous. In ADVISOR 2 (and probably in ADVISOR 1) there was confusion between the number of times a product is ordered/year and the frequency of purchase decision. For this reason the variable was excluded from analysis.

Finally, market share, which was a strong variable in ADVISOR 1, was not found to have an effect in ADVISOR 2. We resolve this seeming inconsistency below.

In ADVISOR 1, A/S was related to market share negatively:

$$A/S \sim \frac{1}{D}$$

where $\sim$ means "is related to" and D represents market share. The relationship shows that as share increased, A/S decreases.

In ADVISOR 2:

$$A \sim S^{.6} \quad \text{or}$$

$$\frac{A}{S} \sim \frac{1}{S^{.4}}$$

We ran a regression and found that market share was highly related to sales, as

$$D \sim S^{.2}$$

Using this result we get

$$\frac{A}{S} \sim \frac{1}{D^2} \quad \text{in ADVISOR 2.}$$

Thus, we see from the above relationship that the implication of the ADVISOR 2 model is that A/S is related to market share in the same way

as in ADVISOR 1. In fact, if the ADVISOR 1 approach was duplicated, market share would surely be included in the model.

In all likelihood, market share was included in the ADVISOR 1 model as a correction factor, trying to compensate for the assumption that A/S was modeled as a constant, a model mis-specification. The inverse relationship with market share served to deflate that ratio when sales got larger. Our exponent of sales, less than 1 in ADVISOR 2, serves the same purpose and does it directly.

Thus we conclude that our ADVISOR 2 analysis is not in conflict with that of ADVISOR 1, but rather improves upon and deepens our understanding of the process.

7. Media Allocation

The poorest models in ADVISOR 1 were the media allocation models. These results were confirmed in ADVISOR 2. The selection of space versus direct mail is guided as much by specific market situations (more trade books in market A than market B, the number and frequency of trade shows, etc.), that by our general product and market characteristics.

We did feel we could model the decision process between two major categories of advertising expenditures: those which directly support the salesman or are associated with personal contact from the marketer (shows, sales promotion and films) and those which are not (mainly space, direct mail and brochures).

We anticipated that the variables in the advertising equation would all be important here, and that some others like product distinguishability and the number of salesmen would also be important. That proved not to be the

case, and only the variables included in the advertising equation were included in the advertising split equations. (Note that PERS = dollar level of expenditure on personal media; IMPERS is defined comparably). Exhibits 19 and 20 give the results.

The signs of all the coefficients in these equations are consistent with the results of the advertising equation. Exhibit 21 compares these two models, the arrow (↑) indicates the personal equation has the stronger effect for a given variable. In each case the effect on the total advertising budget is intermediate between the two separate effects.

Exhibit 19

Personal Media Model

LN(PERS)	=	-3.086		
		+ .673	LN(SALES)	(7.9)
		+ .129	LN(USERS)	(3.6)
		-1.611	LN(CONC)	(2.1)
		-2.029	LN(SPECIAL)	(3.7)
		- .984	LCYCLE	(3.2)
		-1.536	PLANS1	(4.9)

R^2 = .52

SEE = 1.39

F = 18.5

N =109

Exhibit 20

Impersonal Media Model

LN (IMPERS) = - .417

+	.554	LN(SALES)	(8.2)
+	.101	LN(USERS)	(3.6)
-	1.911	LN(CONC)	(3.2)
-	1.580	LN(SPECIAL)	(3.6)
-	.782	LCYCLE	(3.2)
-	1.408	PLANS1	(5.7)

R^2 = .56

SEE = 1.11

F = 21.4

N =109

Exhibit 21

Allocation of Advertising Comparison

	SALES	USERS	CONC	SPECIAL	LCYCLE	PLANS
Personal	↑	↑	↓	↑	↑	↑

↑ means variable effects the personal equation more than the impersonal equation.

Note that only concentration of customers signals a greater relative impact on personal media than impersonal media. This, consistent with the much larger intercept of the impersonal equation, signifies that the impersonal portion is somewhat less sensitive to market factors than is the personal portion of the advertising expenditures

8. Discussion

There are a number of variables that are missing from the analysis. Market share has already been explained. We treat others in turn.

Profitability: The relationship with product profitability is marginal at best. This may suggest two conflicting effects. Some products spend more because of high margins. Others may have low margins because of low volume and correspondingly high allocations of fixed cost; thus they spend more when their margins are low. We feel the problem is treated in the PLANS variable for predictive purposes, although the issue is not completely resolved.

Plant utilization: We feel this variable is incorporated in the PLANS variable where relevant. There are also a number of products in the data base which share plant capacity and for which plant utilization is irrelevant.

Purchase frequency: This is somewhat ambiguous and does not seem important here, although it is included in the channels of distribution model in Part II of this paper.

Finally, as in ADVISOR, we must address the issue of whether the results are real. It is thus important to understand the advantages and limitations of this research.

First, it should be noted that the experienced managers involved in this study generally agree that the major variables above do, in fact, affect budget decisions in an aggregate, industry-average way. However, their limited experience does not permit them to say to what degree. ADVISOR 2 refines this situation. It puts magnitudes and ranges on the effects of a number of key variables. This is new knowledge. The results do what they were intended to: they carefully play back business practice and identify significant effects which can be used as norms and guidelines by industrial marketing managers.

Our data base is not exhaustive and we must distinguish between the accuracy of measuring an affect and the accuracy of prediction. If we had four times as many products, our measurements of the contribution of significant variables would be about twice as accurate, and we would almost certainly measure more variables successfully.

On the other hand, we would probably not be able to improve our prediction very much. This is because there are specific factors -- changes in management, for example -- that would not be accounted for by any set of variables we could reasonably include in the study.

Thus we conclude that real effects have been measured. The measurements must be interpreted in the context of this specific analysis, but they represent a significant addition to our understanding of the determinants of industrial marketing budgets.

Part II of this paper treats the issue of use of results -- both by managers and by researchers--as well as two topics not addressed in ADVISOR 1: marketing change norms and distribution channel norms.

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APPENDIX 1

VARIABLE DEFINITIONS

(All Models)

Variable Name	Description	Models
ADV	Total amount of money spent on advertising and sales promotion for this product, including production	
COSIZE	Total company (or division) $ sales	DISTRIBUTION
CONC	Fraction of industry dollar sales purchased by industry's three largest customers	CHANGE-ADV, MEDIA
CPLANS	Change in product plans +2 from current year to year-1. (See definition of PLANS.)	CHANGE-ADV, MEDIA
DIFF	Difference between how current customers and prospective customers perceive product quality relative to industry average. = 0, prospective customers perceived quality higher than current customers. = 1, otherwise	NORM-A/M, MKTQ
DIRUSER	Fraction of sales volume made direct to users + fraction of sales volume made to users via company owned resellers + 1.	NORM-A/M
DLCYCL	Stage in product life cycle = 0, introduction or growth = 1, maturity or decline	DISTRIBUTION
EXTL	Fraction of sales volume made to independent resellers.	DISTRIBUTION
FREQ	Mean purchase frequency per year = 52 * V098 + 26 * V099 + 7 * V100 + V101 + .2 * V102 + .1 * V103	DISTRIBUTION

IMPERS	Fraction of advertising dollars spent on "impersonal" (other than exhibitions and trade shows, industrial films, and sales promotion) media	NORM-MEDIA*
INTL	Fraction of sales volume made direct to users + fraction of sales volume made to users via company-owned resellers	DISTRIBUTION*
LCONC	LN (1. + CONC)	NORM-ADV, MEDIA, MKTG
LCUSER	LN (No. of industry downstream specifiers year-1 + " " " users year-1 + " " " independent resellers year-1	CHANGE-ADV, MEDIA
LCYCLE	Stage in product life cycle = 0, growth = 1, maturity Missing, introduction or decline	NORM-ADV, MKTG, MEDIA CHANGE-MEDIA
LDIRUSER	LN (DIRUSER + 1.)	NORM-MKTG
LSLMN	LN(PSTS year-1) (See definition of PSTS) Note: PSTS is taken as a surrogate for number of effective salesmen.	CHANGE-MEDIA
LSLS	LN(Product $ sales * 1000.year-1)	NORM-ADV, MEDIA, A/M, MKTG
LSPEC	LN(SPEC + 1.) (see definition of SPEC)	NORM-ADV, MEDIA, MKTG

LUSERS	LN(No. of industry downstream specifiers + " " " users* No. of usual decision makers in user's organization + No. of industry independent resellers* No. of usual decision makers in reseller's organization)	NORM-ADV, MEDIA, MKTG
MKTG	PSTS + ADV	
NCOM	(No. of major competitors (over 1% market share year-1) — No. of major competitors year-2) / No. of major competitors year-2	CHANGE-ADV
PROD1	Product complexity - = 1, if the product is machinery and equipment, or component parts. = 0, otherwise	NORM-MKTG, A/M
PSTS	Total amount of money spent on Personal Selling and Technical Service for the product (including applicable overhead) - in the current year	
SPEC	Fraction of product's volume sales produced to order	
STAND	Fraction of product's volume sales carried in inventory	DISTRIBUTION
TECH	The importance of technical service in this product category	DISTRIBUTION
ORDER	Average size (volume, units) of a purchase of this product by users in the current year	DISTRIBUTION

PERS	Fraction of advertising dollars spent on "personal" media - exhibitions & trade shows - industrial films - sales promotion	
PLANS	Positivity of product plans and objectives	
PLANS1	= 1, if product plans are "positive" = 0, otherwise	NORM-MKTG, MEDIA, ADV
PMSD	Proportion change in $ market share $\left(\frac{\text{your product \$ sales}}{\text{industry \$ sales}}\right)$ from year-1 to year-2	CHANGE-MEDIA, ADV

APPENDIX 2

This appendix includes the correlation matrices that are associated with the models presented in Part I of this paper.

Advertising Correlation Matrix

	LADV	LS74	LUSERS74	LSPECIAL	LCONC	LCYCLE
LADV						
LS74	0.524					
LUSERS74	0.307	0.136				
LSPECIAL	-0.128	0.188	-0.083			
LCONC	-0.242	-0.195	-0.122	-0.060		
LCYCLE	-0.001	0.317	0.207	0.040	-0.228	
PLANS1	-0.273	0.103	0.030	-0.149	-0.092	0.084

Advertising/Marketing Correlation Matrix

	LOGIT(A/M)	LS74	PROD1	DIFFPERC
LOGIT(A/M)				
LS74	-0.431			
PROD1	-0.120	0.054		
DIFFPERC	0.229	-0.092	-0.076	
DIRUSERS	-0.102	0.057	-0.249	-0.012

Marketing Correlation Matrix

	LMKTS	LS74	LUSERS74	LCONC	LSPECIAL	LCYCLE	PLANS1	PROD1	DIFFPERC
LS74	0.733								
LUSERS74	0.368	0.146							
LCONC	-0.293	-0.202	-0.144						
LSPECIAL	-0.003	0.214	-0.062	-0.072					
LCYCLE	0.213	0.329	0.193	-0.240	0.074				
PLANS1	-0.086	0.090	0.017	-0.082	-0.145	0.058			
PROD1	0.234	-0.012	0.448	-0.037	-0.210	0.216	0.073		
DIFFPERC	-0.086	-0.038	0.023	-0.080	0.031	-0.058	-0.143	-0.116	
LDIRUSER	-0.013	0.088	-0.263	0.257	0.145	-0.247	-0.025	-0.200	-0.010

Media Correlation Matrix

	LPERS	LIMPERS	LS74	LUSERS74	LSPECIAL	LCONC	PLANS1
LIMPERS	0.749						
LS74	0.494	0.505					
LUSERS74	0.321	0.314	0.140				
LSPECIAL	-0.114	-0.089	0.204	-0.092			
LCONC	-0.195	-0.259	-0.196	-0.122	-0.060		
PLANS1	-0.246	-0.281	0.099	0.032	-0.142	-0.092	
LCYCLE	0.000	0.017	0.324	0.205	0.029	-0.229	0.088